

POHONO BRIDGE
Yosemite National Park Roads and Bridges
Spanning Merced River on Southside Road
Yosemite National Park
Mariposa County
California

HAER NO. CA-90

HAER
CAL
22-YOSEM,
14-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
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POHONO BRIDGE
Yosemite National Park
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I. INTRODUCTION

Location:

The Pohono Bridge carries the main park entrance road across the Merced River at the west end of Yosemite Valley in Yosemite National Park, Mariposa County, California.

QUAD: EL CAPITAN, CA
UTM: 11/265140/4177525

Date of Construction:

1928

Designer and Builder:

Designed by George D. Whittle, Senior Highway Engineer for the San Francisco district office of the Bureau of Public Roads.

Contractors: Rocca and Caletti

Original and Present Owner:

Yosemite National Park, National Park Service.

Structure Type:

Stone-faced reinforced concrete filled spandrel arch bridge

FHWA Structure No.:

B800-001P

Present Use:

Park road bridge.

Significance:

Pohono Bridge exemplifies the National Park Service "rustic style" of architecture though its use of a stone veneer to conceal its reinforced concrete substructure.

Project Information:

Documentation of Pohono Bridge is part of the Yosemite National Park Roads and Bridges Recording Project, conducted in summer 1991 by the Historic American Engineering Record.

Richard H. Quin, Historian

II. HISTORY

This is one in a series of reports prepared for the Yosemite National Park Roads and Bridges Recording Project. HAER No. CA-117, YOSEMITE NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads.

HISTORY OF POHONO BRIDGE

The Pohono Bridge spans the Merced River in the lower end of Yosemite Valley, about four miles southwest of Yosemite Village. The single-span reinforced concrete and stone masonry structure is the first of a series of stone-faced arch bridges encountered by motorists entering the Valley over the Big Oak Flat Road [HAER No. CA-117c] and the All-Weather Highway [HAER No. CA-117f], and establishes a pattern for "rustic-style" bridges found throughout the park. The structure is actually constructed on a reinforced concrete arch, but the functional stone masonry arch rings and the stone spandrel, wing and parapet walls, give the structure the appearance of being of rustic masonry construction.

The first bridge on the site was built by 1B6B under the auspices of the Board of Commissioners of the Yosemite Grant. The Board authorized the construction of a "substantial bridge at the foot of Bridal Vale Valley," at about the point at which the saddle trails from the north and south entered Yosemite Valley. The bridge was built along with other spans across the river at Happy Isles (the "Tisaack Bridge") and across Bridalveil Creek. The new bridges were elements of a circuit road laid out around Yosemite Valley at the same time.¹ The *Mariposa Gazette* of 11 January 1B68 mentions a bridge being built here, but the 17 April issue noted that the span was carried away by a flood. A replacement span was evidently built, but there is apparently no record of the structure. Boulders above the bridge were blasted out of the river by order of the Board of Commissioners of the Yosemite Grant in 1B81.²

A new bridge of Douglas fir construction was erected in the spring of 1BB2. In 1886, James Mason Hutchings, an early Yosemite hotelier and promoter, described Pohono Bridge and its setting in his characteristic flowery prose but offered few details of its construction:

A casual glance at this substantial structure will present an example of the strength, solidity, and permanence with which the Board of Commissioners are making the necessary improvements about the Valley. Looking down upon the swiftly surging current below the bridge, or the placid stretch of dark green water above it, one can scarcely refrain from exclaiming, "What a glorious picture gallery. Verily!"³

To guard against the weight of heavy snow loads, the bridge decking was generally removed in the late fall just before the first big winter storms.⁴ However, snow was not the only problem, as the bridge was washed away again in the winter of 1893-94. The *Gazette* noted the completion of another replacement span in its 27 April 1B95 issue, but gave no details of construction.⁵

The Pohono Bridge was replaced again under a military contract in 1908.⁶ The new structure was a 100' steel truss bridge. This bridge was apparently only adequate for the stage and wagon traffic then allowed in the park. Automobiles were reintroduced in Yosemite National Park in 1913, and the bridge was restricted to loads of up to three tons. Heavier traffic had to be diverted to the El Capitan Bridge, which could handle loads up to six tons.

In his 1916 annual report to the Secretary of the Interior, Washington B. Lewis, the first Yosemite Park Superintendent under National Park Service administration, called for the bridge's replacement with a structure which could bear loads of up to fifteen tons. (Lewis also requested the replacement of most of the other Valley bridges, as little bridge work had been done under the previous military administration.)⁷

The National Park Service signed a Memorandum of Agreement with the Bureau of Public Roads (U.S. Department of Agriculture) in 1925, under the terms of which the BPR assumed responsibility for construction and rebuilding of roads in the National Parks. In Yosemite National Park, the BPR's first projects involved paving Valley roads and replacing early bridges.

The new Pohono Bridge was designed by George D. Whittle, Senior Highway Engineer with the Bureau of Public Roads' San Francisco office. Several alternative designs were offered to the National Park Service. Daniel Hull, head of the NPS Landscape Engineering Division, finally selected the Alterate No. 6, which was for a stone-veneered reinforced concrete structure. Nathan W. Morgan, NPS Office Engineer, modified the design to provide for curved wing walls at the ends and the use of larger stones for the facing. The final design was reviewed and improved by two members of the National Commission on Fine Arts.⁸

Construction began in April 1928 with the excavation and pouring of the north abutment. The south abutment was started as well, but work was halted by high water. All work soon came to a halt as the river continued to rise. In June, the quarrying of the stone was completed and the stonecutters were discharged. Final excavation of the south abutment was done in July, and the laying of reinforcing steel was begun. This abutment was poured in August. The arch ring stones or voussoirs were then erected, more reinforcing steel was put in place, spandrel walls were constructed, and pouring of the concrete commenced. By the end of September, the bridge was 90 percent complete; the only work remaining was construction of one of the guard walls, placing of the waterproof membrane coating, and the fill. The final work was carried out quickly. The bridge was soon paved, and it was put into use in October.⁹ Total cost of the structure was \$29,081.55.¹⁰

The paving was done under a separate contract. No rough grade was required. A base of 2"-4" of crushed rock was first applied. Depressions were filled with quarry rejects that were watered down. The grade was then compressed with a 12-ton three-wheel roller. A finished base of 4" of crushed rock was then applied. Another 1½" to 2" of fine rock was then applied and sprayed with bitumuls. The pavement was then rolled to a 6½" thickness. It was sprayed with bitumuls again, covered with another ½" to ¾" of crushed rock, and rolled again. The paving work cost \$2001.15.¹¹

Pohono Bridge is a single-span semi-elliptical reinforced concrete structure, faced with native granite and filled with compacted earth. The structure is 132' long and 35' long. This broad width originally provided for two 10' lanes (one-way into the Valley) with 3' 6" shoulders to the sides; the roadway has since been widened to two 13' lanes, taking up most of the shoulders. A 5' wide sidewalk, originally designed as a bridle path, is set apart from the roadway by a stone curb and runs along the northwest side. (This marks a departure from the general pattern; the other Valley bridges constructed in the same period have sidewalks or bridle paths on each side.) The single arch has a clear span of 80', and rises 13' 4½" from the springing line. The bridge rests on poured concrete footings that were carried to a firm foundation. The reinforced concrete barrel vault was poured within the masonry spandrel walls, which acted as formwork on a grid of steel reinforcing

bars. These were 1" diameter rods on 12" centers on the top and bottom, and $\frac{1}{2}$ " transverse rod on 24" centers, all mounted on hooped stirrups. The arch ring stones or voussoirs are joined to the concrete by steel cramps. Several pours were required, and the joints made use of shear keys 2" deep and 4" inches wide, increasing in dimension to one-third the width of the wall at the spring line. The granite stone masonry spandrel walls are built with a maximum batter of 2:12. Concrete used in the arch rings is Class "A," while that is used in the abutments is Class "B." (Classes of concrete refer to the amount of Portland cement used in the mixture, with Class "A" having the highest proportion and so on.) A membrane waterproofing barrier was applied to the concrete before the structure was filled with compacted earth.¹²

III. ENDNOTES

1. Linda Wedel Greene, *Yosemite, The Park and Its Resources: A History of the Discovery, Management, and Physical Development of Yosemite National Park, California*. 3 vols. (Washington, D.C.: National Park Service, 1987), I:67, 282; "Yo Semite Valley," *Mariposa Gazette*, 11 January 1868, 2.
2. *Mariposa Gazette*, 11 January 1868, 17 April 1868; "Yosemite Valley--Interesting Proceedings of the Board of Commissioners," *Mariposa Gazette*, 18 June 1881, 2.
3. James M. Hutchings, *In the Heart of the Sierras, the Yo Semite Valley, Both Historical and Descriptive, and Scenes by the Way; the Big Tree Groves, the High Sierra, with its Magnificent Scenery, Ancient and Modern Glaciers, and Other Points of Interest, with Tables of Distances and Altitudes, Maps, Etc., Profusely Illustrated* (Oakland, CA: Pacific Press Publishing House, 1886; reprint, Lafayette, CA: Great West Books, 1990), 402.
4. Laurence V. Degnan to Douglass H. Hubbard, 8 January 1957. Yosemite Research Library.
5. Materials from Hood files (uncatalogued), Yosemite Research Library, made available by Yosemite National Park Historian Jim Snyder.
6. Greene, I:415.
7. Washington B. Lewis, "Report of the Superintendent of Yosemite National Park" in *Reports of the Department of the Interior*, 1916, 2 vols. (Washington, D.C.: Government Printing Office, 1917), I:790
8. Robert Charles Pavlik, "In Harmony with the Landscape: A History of the Built Environment of Yosemite National Park, 1915-1940," (Master's thesis, University of California at Santa Barbara, 1986), 47-48; Nathan W. Morgan, Office Engineer, National Park Service, Mesa Verde National Park, to Bert H. Burrell, Acting Chief Civil Engineer, National Park Service, Portland, Oregon, 4 October 1925, National Archives, Record Group 79, Entry 22, Box 18, Mesa Verde file.
9. E. P. Leavitt, Acting Superintendent's Monthly Report, April 1928, 4; E. C. Solinsky, Acting Superintendent's Monthly Report, May 1928, 6; Leavitt, Acting Superintendent's Monthly Report, June 1928, 4; Acting Superintendent's Monthly Report, July 1928, 4; Acting Superintendent's Monthly Report, August 1928, 3; Acting Superintendent's Monthly Report, September 1928, 3; Acting Superintendent's Monthly Report, October 1928, 5.
10. Merrill Ann Wilson, National Register of Historic Places nomination for the Yosemite Valley bridges, August 1976, Sec. 7 p. 2.

11. O. G. Taylor, Resident Park Engineer and Charles Goff Thomson, Superintendent, "Final Construction Report #24, Pohono Bridge Paving," 29 November 1929, 1-2. Yosemite National Park Maintenance and Engineering Office.

12. Construction details taken from U.S. Department of Agriculture, Bureau of Public Roads, "Yosemite National Park, Plans for Five Bridges, Pohono Bridge," construction drawing, sheet 4, December 1926; Idem, "Yosemite National Park, Plans for Five Bridges, Details of Construction," construction drawing, sheet 3, December 1926. Additional information from the HAER field survey, August 1991.

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"Yosemite Valley--Interesting Proceedings of the Board of Commissioners."
Mariposa Gazette, 18 June 1881, 2.